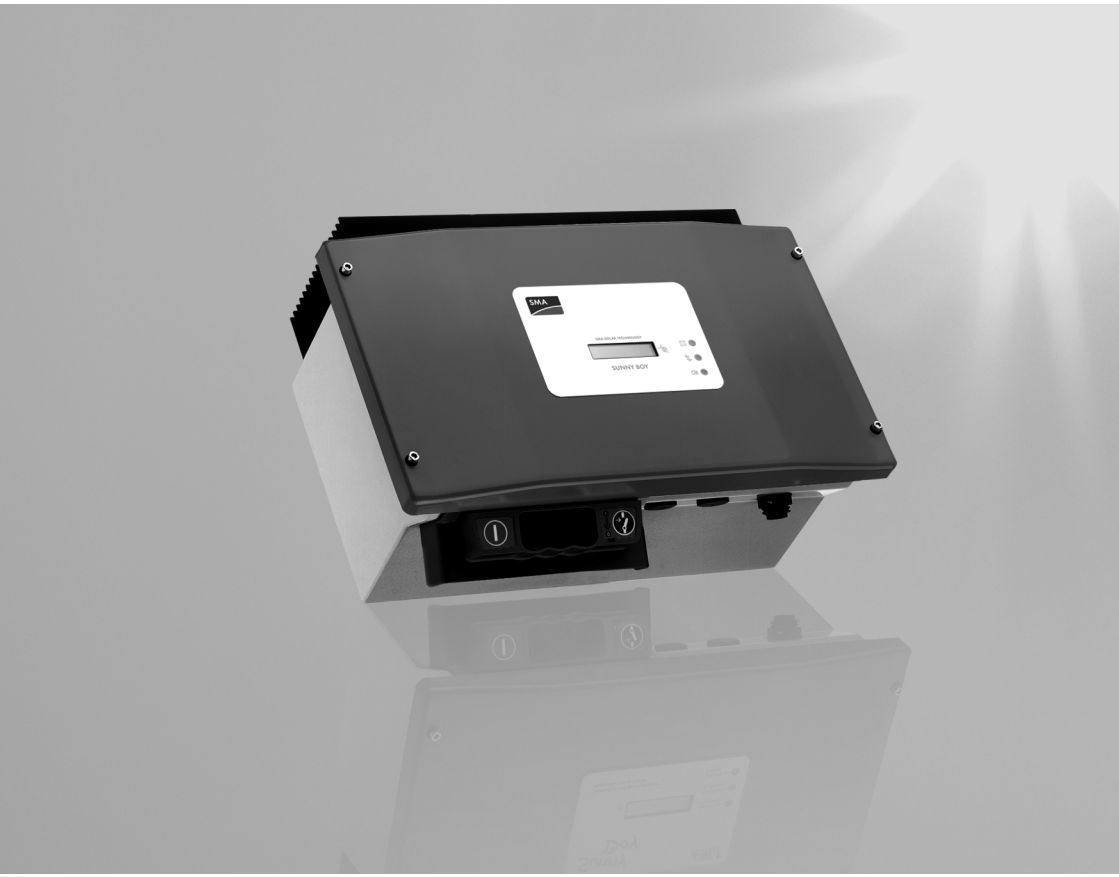
PV Inverter

SUNNY BOY 1100 / 1700

Installation Guide



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EN

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1 Notes on this Manual

This manual describes how to mount, install, commission and service the Sunny Boy 1100 (SB 1100) and Sunny Boy 1700 (SB 1700). Store this manual where it will be accessible at all times.

1.1 Validity

This manual is valid for the Sunny Boy 1100 and Sunny Boy 1700.

1.2 Target Group

This manual is for qualified personnel. The tasks described in this manual may only be performed by qualified personnel.

1.3 Additional Information

You will find further information on special topics such as designing a line circuit breaker or the description of the operating parameters in the download area at www.SMA.de.

Refer to the user manual for detailed information on troubleshooting and operating the Sunny Boy.

1.4 Symbols Used

The following types of safety instructions and general information appear in this document as described below:

DANGER!

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING!

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION!

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE!

NOTICE indicates a situation that can result in property damage if not avoided.

Information

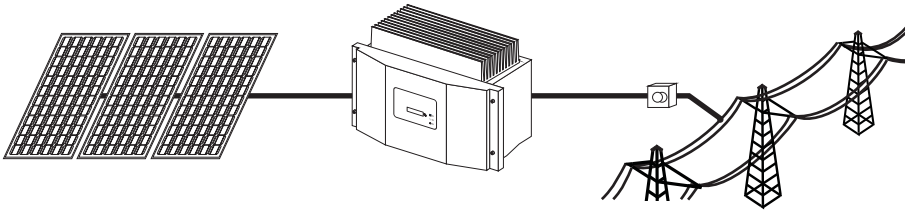
Information provides tips that are valuable for the optimal installation and operation of your product.

2 Safety

2.1 Appropriate Usage

The Sunny Boy is a PV inverter, which converts the DC current of the PV generator to AC current and feeds it into the public grid.

Principle of a PV system with this Sunny Boy



The Sunny Boy may only be operated with PV generators (modules and cabling) of protection class II. Do not connect any sources of energy other than PV modules to the Sunny Boy.

When designing the PV system, ensure that the values comply with the permitted operating range of all components at all times. The free design program "Sunny Design" (www.SMA.de/en/SunnyDesign) will assist you. The manufacturer of the PV modules must have approved the modules for use with this Sunny Boy unit. You must also ensure that all measures recommended by the module manufacturer for long-term maintenance of the module properties are taken (see also Technical Information "Module Technology", in the download area of www.SMA.de).

Do not use the Sunny Boy for purposes other than those described here. Alternative uses, modifications to the Sunny Boy or the installation of components not expressly recommended or sold by the manufacturer void the warranty claims and operation permission.

2.2 Safety Precautions

DANGER!

Danger to life due to high voltages in the Sunny Boy!

- All work on the Sunny Boy must be carried out exclusively by qualified personnel.

CAUTION!

Danger of burn injuries due to hot housing parts!

- Do not touch the housing of the Sunny Boy during operation.

NOTICE!

Foreign objects or water entering the Sunny Boy can damage the device!

Once the Electronic Solar Switch has been pulled out, the Sunny Boy only provides protection degree IP21. The Sunny Boy is then no longer protected against water and contamination with dirt!

If the device has been temporarily decommissioned, proceed as follows to restore the IP65 protection rating:

- Unplug all DC plug connectors and seal them with the protecting caps provided.
- Attach the Electronic Solar Switch again.

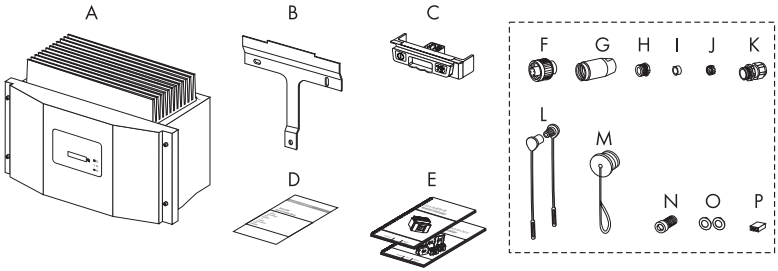
Grounding the PV generator

Comply with the local requirements for grounding the modules and the PV generator. SMA Solar Technology recommends connecting and grounding the generator frame and other electricity conducting surfaces in such a way that there is continuous conduction and grounding in order to achieve maximum protection for systems and persons.

3 Unpacking

3.1 Packing List

Check the delivery for completeness and for visible external damage, such as cracks in the housing or in the display. If something is missing or damaged, contact your dealer.



Object	Quantity	Description
A	1	Sunny Boy
B	1	Wall mounting bracket
C	1	Electronic Solar Switch (ESS)
D	1	Set of documents
E	2	1 installation guide, 1 user manual
Contents of accessories bag		
F	1	Socket element
G	1	Threaded sleeve
H	1	Pressure screw for PG13.5
I	1	Sealing ring for PG13.5
J	1	Fastening case for PG13.5
K	1	PG16 pressure screw for large cable cross-sections
L	2	Protecting caps for DC connector
M	1	Protecting cap for AC screw clamp
N	1	M6 x 12 cylinder head screw
O	2	Polyamid M5 washer (as substitute for cover)
P	1	Jumper

3.2 Identifying the Sunny Boy

You can identify the Sunny Boy using the type label. The type label is on the right side of the housing. The type (Type/Model) and the serial number (Serial No.) of the Sunny Boy can be found on the type label, among other things.

4 Mounting

4.1 Selecting the Mounting Location

DANGER!

Danger to life due to fire or explosion!

Despite careful construction, a fire can occur with electrical devices.

Do not install the Sunny Boy

- on flammable construction materials,
- in areas where highly flammable materials are stored,
- in potentially explosive areas!

CAUTION!

Danger of burn injuries due to hot housing parts!

- Mount the Sunny Boy in such a way that it cannot be touched inadvertently during operation.

CAUTION!

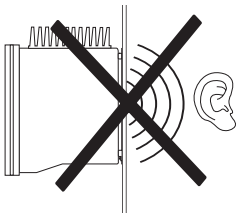
Risk of injury due to the heavy weight of the Sunny Boy!

- Take the Sunny Boy's weight of 25 kg into account for mounting.

Take the following conditions into account during mounting

- The mounting location and mounting method must be suitable for the weight and dimensions (see section11 „Technical Data“ (39)) of the Sunny Boy.
- Mount on a solid surface.
- The mounting location must be accessible at all times.
- The Sunny Boy must be easy to remove from the mounting location at any time.
- The ambient temperature should be below +40 °C to guarantee optimal operation.
- Do not expose the Sunny Boy to direct sunlight, so as to avoid power reduction due to excessive heating.
- In a living area, do not mount the unit on plasterboard walls (or similar) in order to avoid audible vibrations.

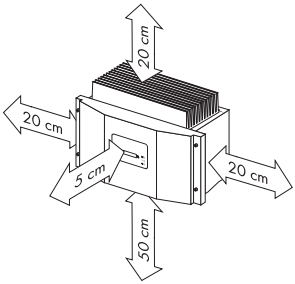
  The Sunny Boy can make noises when in use which can be regarded as a nuisance when installed in a living area.



4.1.1 Safety Clearances

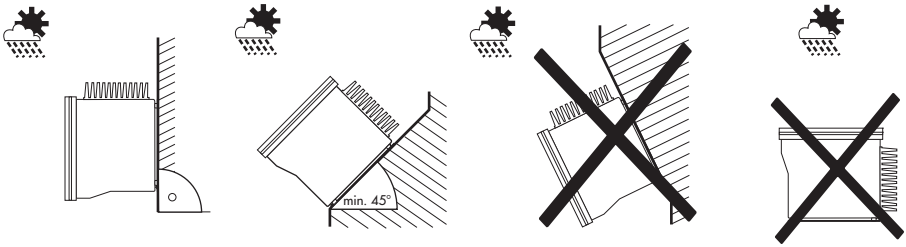
Observe the following minimum clearances to walls, other devices or objects to guarantee sufficient heat dissipation and enough space for removing the Electronic Solar Switch.

Direction	Minimum Clearances
Sides	20 cm
Top	20 cm
Bottom	50 cm
Front	5 cm



4.1.2 Position

- Vertical installation or tilted backwards by max. 45°.



- Never install the device with a forward tilt.
- Do not install horizontally.
- Install at eye level to allow operating modes to be read.

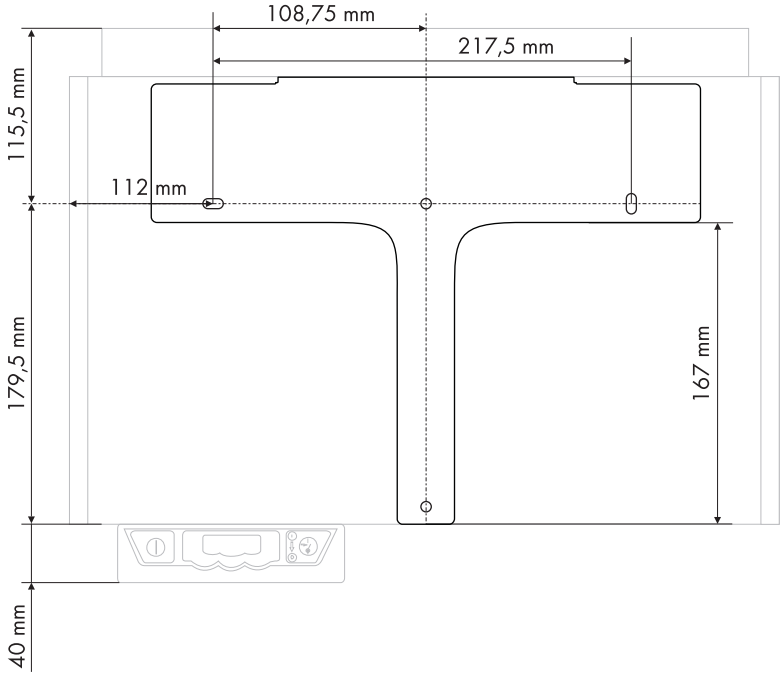
4.2 Mounting Instructions

CAUTION!

Risk of injury due to the heavy weight of the Sunny Boy!

- Take the Sunny Boy's weight of 25 kg into account.

1. Use the wall mounting bracket as a drilling template and mark the position of the drill holes.

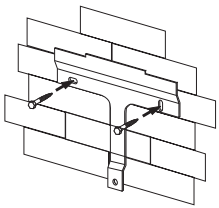


Mounting material

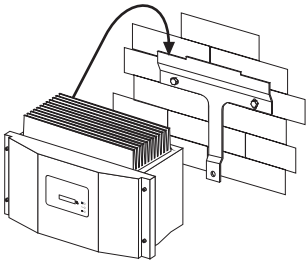
Attach the wall mounting bracket with the corresponding mounting material (depending on the surface).

2. Attach the wall mounting bracket to the wall using suitable screws and washers.

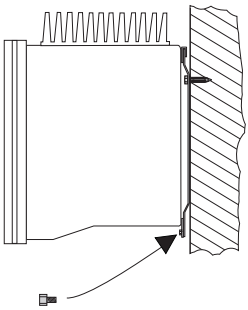
   For vertical installation and installation on solid concrete or block walls, for example, you can fit the wall mounting bracket using 6 mm x 50 mm hexagon bolts to DIN 571 standard, stainless steel type, and with wall anchors of type SX 8.



3. Hang the Sunny Boy with its upper mounting plates in the wall mounting bracket so that a lateral shifting from the wall mounting bracket is not possible.



4. Secure the Sunny Boy against lifting by tightening the M6 x 12 screw included in the accessories bag.
5. Check that the unit is securely in place.



☑ The Sunny Boy is now mounted on the wall.

5 Electrical Connection

NOTICE!

Electrostatic discharges can damage the Sunny Boy!

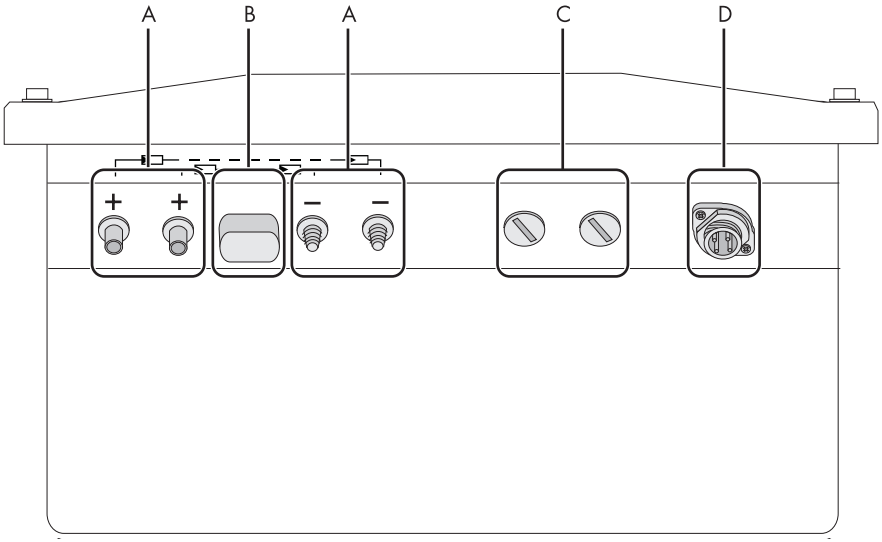
Internal components of the Sunny Boy can be irreparably damaged by static discharge.

- Ground yourself before you touch a component.

5.1 Overview of the Connection Area

5.1.1 View from Below

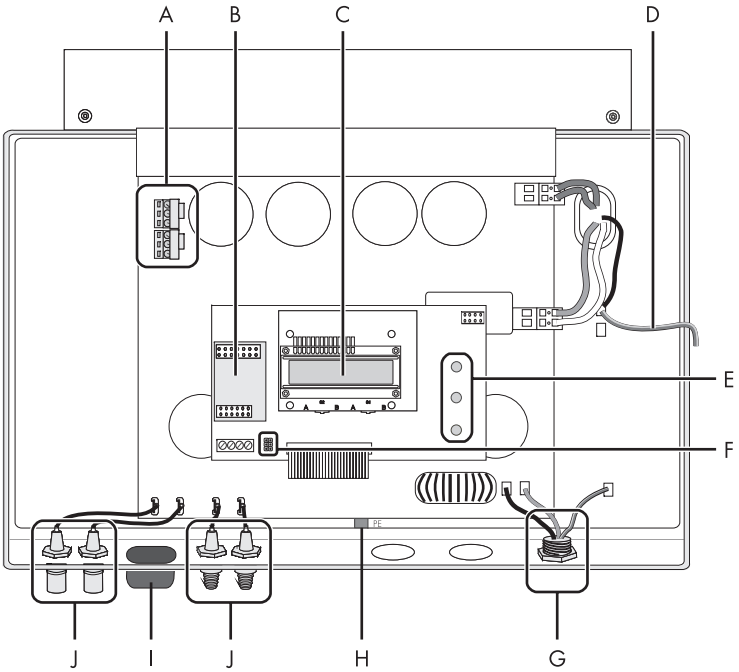
The following figure shows the assignment of the individual enclosure openings on the bottom of the Sunny Boy.



Object	Description
A	Plug connectors for connecting the PV strings
B	Socket for the connection of the Electronic Solar Switch (ESS) DC load disconnection unit
C	Cable opening for communication with seal plugs
D	Cable opening for AC connection

5.1.2 View from Inside

The following diagram gives a schematic overview of the various components and connection points inside the Sunny Boy with the cover removed:



Object	Description
A	Varistors, section 9.1.2
B	Slot for communication (RS 485, radio), section 5.5
C	Display
D	PE (protective earth) connecting cable for cover
E	Operating status LEDs
F	Jumper slot for communication
G	Plug socket (AC), section 5
H	Tab for grounding the cable shield with RS485 communication
I	Electronic Solar Switch (ESS) socket
J	PV input plugs (DC), section 5.2

5.2 Connecting the PV Generator (DC)

Interruption of the current flow

When using distributor connectors (Y connectors), ensure that these are not visible or accessible so that the DC circuit cannot be interrupted with these.

The current flow must always be interrupted beforehand via the Electronic Solar Switch.

- Always unplug the Electronic Solar Switch (ESS) in order to interrupt the current flow.

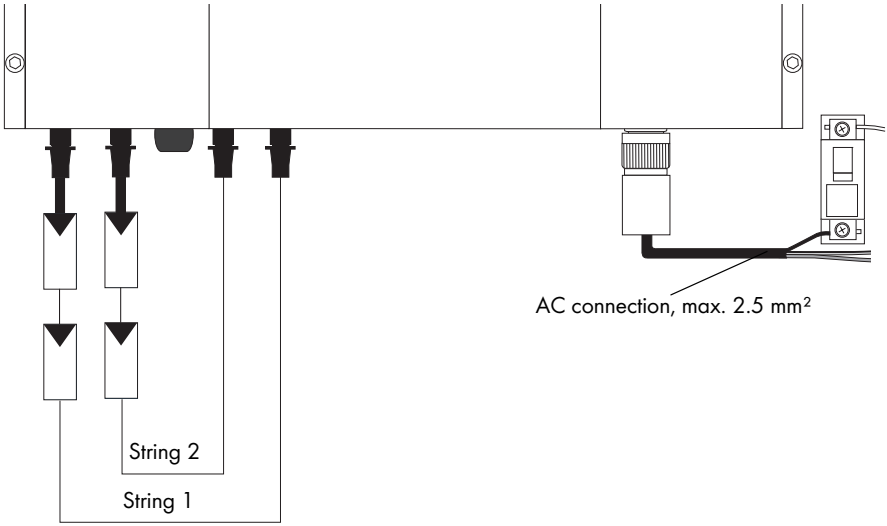
- Requirements for the modules of the connected strings:
  - same type
  - same number
  - identical alignment
  - identical tilt
- The connection cables of the PV modules must be equipped with plug connectors so that the Sunny Boy's DC plug connectors can be connected to them.

A pre-assembled set for the free cable ends of a string is available as an optional accessory. The SMA order codes for the various connectors can be found in section 12 „Accessories“ (43).

- The following limit values at the DC input of the Sunny Boy may not be exceeded:

Inverter	Maximum input voltage	Maximum input current
SB 1100	400 V (DC)	10 A (DC)
SB 1700	400 V (DC)	12.6 A (DC)

The complete wiring for a Sunny Boy is shown schematically in the following figure:



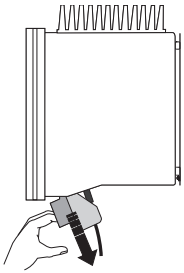
Connection Procedure

DANGER!

Danger to life due to high voltages on the Sunny Boy!

- Before connecting the PV generator, ensure that the line circuit breaker is switched off.

1. Remove the Electronic Solar Switch on the underside of the Sunny Boy.



2. Check the connection cables of the PV modules for the correct polarity and compliance with the maximum input voltage of 400 V (DC).

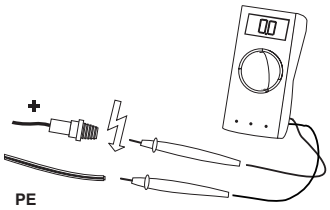
NOTICE!

Exceeding the maximum input voltage can destroy the Sunny Boy!

If the voltage of the PV modules exceeds the maximum input voltage of the Sunny Boy, it can be destroyed by the overvoltage. All warranty claims become void.

- Do not connect strings to the Sunny Boy with open circuit voltage greater than the maximum input voltage of the Sunny Boy.
- Check the system design.

3. Check strings for ground faults as described in section 9.1.1 „Checking the PV Generator for Ground Fault" (34).

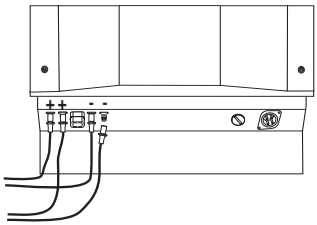


DANGER!

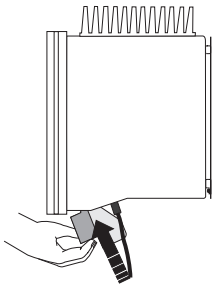
Risk of lethal electric shock!

- Do not connect any strings in which you have detected a ground fault!

4. Connect the faultless strings of the PV generator.
5. Seal the unused DC input sockets with the provided protecting caps.



6. Reinsert the Electronic Solar Switch in the socket on the underside of the Sunny Boy.



NOTICE!

Manipulating the connector in the handle can damage the Electronic Solar Switch!

The connector within the handle must remain movable in order to ensure proper contact. Tightening the screw voids all warranty claims and creates a fire risk.

- Do **not** tighten the connector screw in the Electronic Solar Switch handle.

NOTICE!

The Electronic Solar Switch can be damaged if it is inserted incorrectly!

The Electric Solar Switch can be damaged by high voltage if it has not been attached properly.

- Press the handle firmly into place on the socket of the Electronic Solar Switch until it audibly locks into place.
- Check that the handle is securely in place.

5.3 Connecting the Public Grid (AC)

Connection requirements of the grid operator

Always observe the connection requirements of your grid operator!

Cable Design

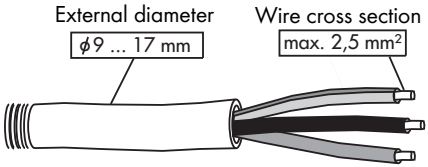
The cable cross section should be sized using the "Sunny Design" design program (www.SMA.de) so that line losses do not exceed 1 % at nominal power.

The Sunny Boy 1100 and 1700 must be connected with a cable cross section of at least 1.5 mm². The cable cross-section required in an individual case depends on factors such as ambient temperature, type of cable installation, and line losses and must be selected according to the valid installation guidelines of the respective country (of the installation location).

The maximum cable lengths related to the cable cross section are presented in the following table.

Cable cross section	Maximum cable length	
	SB 1100	SB 1700
1.5 mm²	21 m	15 m
2.5 mm²	35 m	22.5 m

Cable Requirements



Load Disconnection Unit

Load Disconnection Unit

Use only line circuit breakers as load disconnection units!

A screw type fuse, e.g., D system (Diazed) or D0 system (Neozed) is not a load disconnection unit and therefore must not be used as one.

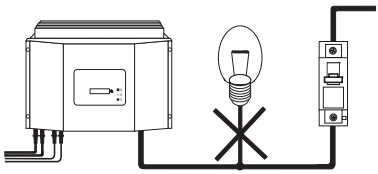
Upon disconnection under load, the screw type fuse element may be destroyed, or its functionality may be inhibited by contact burning. It only acts as cable protection.

The maximal permissible rating is located in the technical data (page 39).

DANGER!

Danger to life due to fire!

When a generator (Sunny Boy) and a consumer are connected to the same line circuit breaker, the protective function of the line circuit breaker is no longer guaranteed. The current from the Sunny Boy and the grid can add up to overcurrent which is not detected by the line circuit breaker.



- Never connect loads unsecured between the Sunny Boy and the line circuit breaker.
- Always install separate fuses for loads.

Rating for a Line Circuit Breaker

Detailed information and examples concerning the rating of a line circuit breaker can be found in the Technical Information "line circuit breaker" in the download area of SMA Solar Technology at www.SMA.de.

Connection Procedure

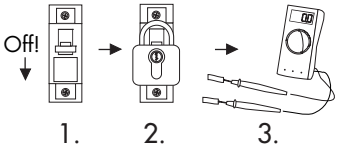
A round plug connector system is used, which allows various cable diameters to be used in the cable outlet. For this, a PG13.5 pressure screw and a PG16 pressure screw are included in the accessories bag. Check which screw fitting is the right one for your AC cable.

1. Check the grid voltage compare with „V_{AC}“ on the type label.

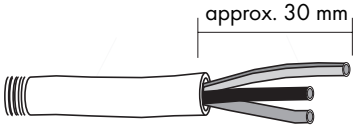
   The exact operating range of the Sunny Boy is specified in the operating parameters. These can be read via a communication component or requested from SMA Solar Technology.

   The grid voltage cannot be more than 253 V since the Sunny Boy will otherwise not be fully operational. In this case, contact the local grid operator for assistance.

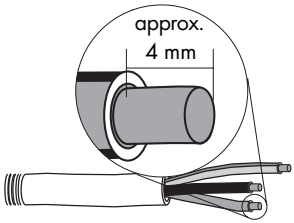
2. Switch off the line circuit breaker, protect against reconnection, and make sure no voltage is present.



3. Dismantle the cable for approximately 30 mm. Shorten L and N by 5 mm.

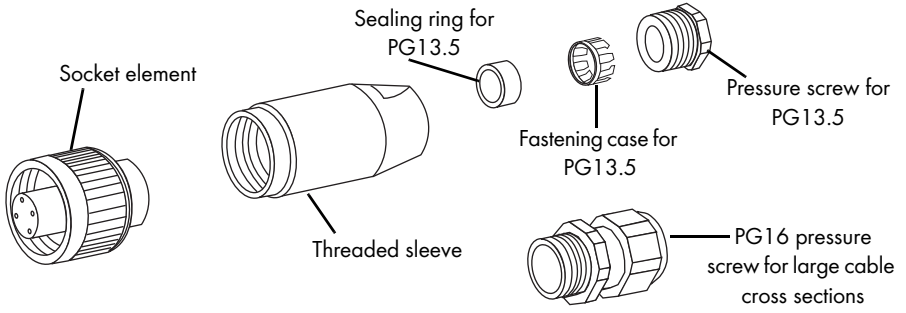


4. Strip the wires of the cable by about 4 mm.



5. Remove the parts of the AC connection socket from the accessories bag and connect the dismantled and stripped cable as described on the following pages.

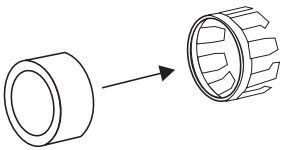
   The accessories bag contains a PG13.5 AC connection socket for connection with a cable diameter of 9 to 13.5 mm and a PG16 AC connection socket for connection with a cable diameter greater than 13.5 mm to a maximum of 17 mm.


Sealing ring for PG13.5
Socket element
Pressure screw for PG13.5
Fastening case for PG13.5
Threaded sleeve
PG16 pressure screw for large cable cross sections

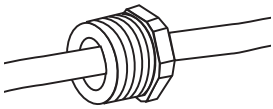
Preparatory work for the connection of cables with a diameter up to 13.5 mm:

➢ Grid voltage lies within the permissible voltage range.

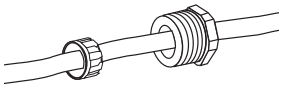
1. Press the sealing ring into the fastening case.



2. Guide the pressure screw for PG13.5 over the AC cable.



3. Guide the fastening case, including the sealing ring, over the AC cable.



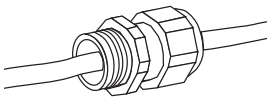
   ☑ Pressure screw and fastening case, including the sealing ring, are guided over the AC cable.

4. Continue with the section "Further procedures" on page 23.

Preparatory work for the connection of cables with a diameter of 13.5 to 17 mm:

➢ Grid voltage lies within the permissible voltage range.

1. Guide the pressure screw for PG16 over the AC cable.



   ☑ Pressure screw has been guided over the AC cable.

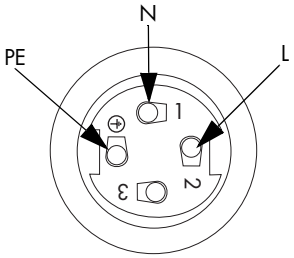
2. Continue with the section "Further procedures" on page 23.

Further Procedures

➢ Pressure screw and, where applicable, the fastening case including the sealing ring have been guided over the AC cable.

1. Guide the threaded sleeve over the AC cable.
2. Insert the protective earth PE (green-yellow) in the screw terminal with the earth sign on the socket element and tighten the screw.
3. Insert the neutral conductor N (blue) in the screw terminal 1 on the socket and tighten the screw.
4. Insert the live wire L (brown or black) in the screw terminal 2 and tighten the screw.
5. Leave screw terminal 3 free.
6. Screw the threaded sleeve onto the socket element.
7. Screw the pressure screw tightly onto the threaded sleeve.

   ☑ AC connection socket has been screwed together.



8. Seal the socket element with the provided protecting cap if the Sunny Boy is not immediately connected.
9. Insert the AC connection socket into the AC socket on the Sunny Boy. If applicable, remove the AC socket's protection cap beforehand.
10. Screw the AC connection socket's threaded ring tightly onto the AC socket on the Sunny Boy. The threaded ring acts as a seal and a cable grip for the AC connection socket.

☑ The AC cable is connected to the Sunny Boy.

DANGER!

Danger to life due to high voltages in the Sunny Boy!

- Do not switch on the line circuit breaker until the PV generator has been connected and the Sunny Boy is securely closed.

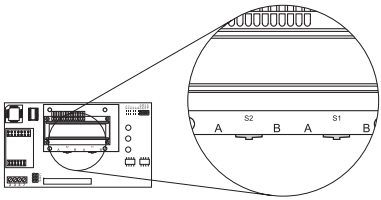
5.4 Setting the Display Language

You can set the language of the display using the switches on the underside of the display assemblies inside the Sunny Boy.

Proceed as follows:

1. Open the Sunny Boy as described in section 7.1 „Opening the Sunny Boy“ (31).
2. Set the switches to the desired language as illustrated below.

Language	Switch S2	Switch S1
German	B	B
English	B	A
French	A	B
Spanish	A	A



3. Close the Sunny Boy as described in section7.2 „Closing the Sunny Boy“ (32).

5.5 Communication

The Sunny Boy is equipped with a slot for communication interfaces in order to communicate with special data acquisition devices or a PC with corresponding software.

See the communication interface documentation for a detailed wiring diagram.

This section describes how to install the communication module in the Sunny Boy.

Installation Procedure

The letters in brackets refer to the figure on the next page.

1. Open Sunny Boy as described in section 7.1 „Opening the Sunny Boy“ (31).

NOTICE!

Electrostatic discharges can damage the communication interface!

- Do not touch components' connections and plug contacts.
- Touch the PE or an unfinished housing part to ground yourself before unpacking the communication interface.

2. Pull the communication cable through one of the cable openings (A) of the Sunny Boy. Use the enclosure opening on the right with radio communications.

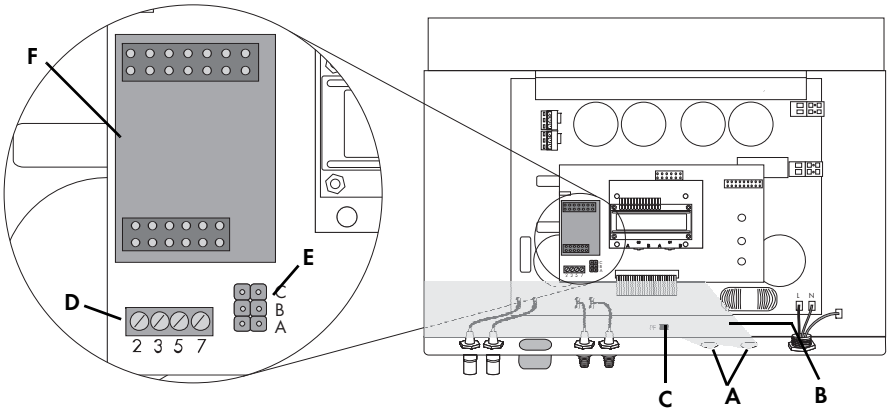
DANGER!

Danger to life through high voltage if there is a fault with the communication cable.

- Pull the silicone tube over the cable.

The silicone tube must completely cover the communication cable inside the housing.

3. If the connection plan of the communication device indicates it as necessary:
   – Ground the shield of the communication cable at the tab (C).
4. Install the communication cable (B) as illustrated in the following figure.
5. Connect the communication cables to the screw terminal strip (D) as described in the connection plan of the communication device.
6. Connect the jumpers (E) if the connection plan of the communication device indicates this as necessary. A detailed description of the jumper functiosn can be found in the communication device documentation.
7. Plug the communication interface left-justified on the interface slot (F).
8. Close the Sunny Boy as described in section 7.2 „Closing the Sunny Boy“ (32).



A	Enclosure openings in the base of the Sunny Boy.
B	Cable route (gray surface)
C	Tab for grounding the cable shield
D	Screw terminals for the connection of the communication wires.
E	Jumper slot
F	Interface slot

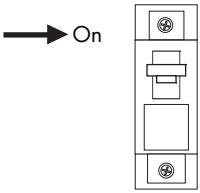
6 Commissioning

Check the following requirements before commissioning:

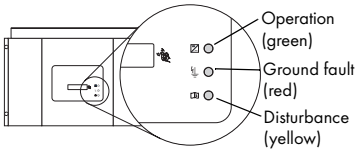
- device is securely in place
- correct connection of the AC cable (grid)
- full connection of the DC cables (PV strings)
- unused DC plug connectors on the underside of the housing are sealed with protecting caps
- the housing cover is securely screwed in place
- the Electronic Solar Switch (ESS) is securely plugged
- the line circuit breaker is laid out correctly

Commissioning Procedure

1. Switch on the line circuit breaker.



2. Now look at the LED display and consult the table on the following page to check whether the Sunny Boy is in a fault-free and expedient operating mode. If this is the case, commissioning has been successfully completed.



6.1 Display

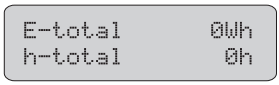
Feeding Operation

After fault-free grid connection of the Sunny Boy, it takes approximately one minute until the following display messages are shown alternately. The display messages shown before only have the purpose of indicating the initialization of the Sunny Boy and the process of controlling whether the power supply requirements are fulfilled.

1. Initially, the energy generated on the respective day and the current operating mode are displayed.

2. After 5 seconds or by tapping on the housing cover, the current feed-in output and the input voltage appear.

3. After a further 5 seconds, or when you tap again, the total energy produced and the time the Sunny Boy has been connected to the grid are displayed.



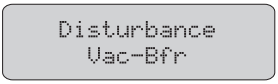
4. Then the cycle begins again.

Disturbance

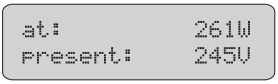
1. In case of a failure, the message "Disturbance" will be indicated in the status bar.

2. The exact failure message follows.

   For example, if the grid fault message shown here is displayed immediately after connection, it may be due to the fact that the AC wire is not correctly connected or the circuit breaker is not switched on yet.



3. If the disturbance was caused by a measured value that does not correspond to the standard, the value measured at the time of the disturbance is displayed. If another measurement is possible, the present value is displayed in the second line.



The precise meaning of the error and status messages are described in the user manual provided for the Sunny Boy.

PV Overvoltage

NOTICE!

Excessive DC input voltage can destroy the Sunny Boy!

- Disconnect the grid voltage and the PV generator from the grid if, after a short period of time, the bottom yellow LED lights up repeatedly 4 times at intervals of one second and the display shows the accompanying message.

Check DC voltage!

- Higher than maximum input voltage: contact the planner / installer of the PV generator for assistance.
- Lower than maximum input voltage: reconnect the Sunny Boy to the generator as described in section 5.2 „Connecting the PV Generator (DC)“ (16).

  If the message occurs again, disconnect the Sunny Boy again and contact the SMA Service Line (see section 13 „Contact“ (44)).

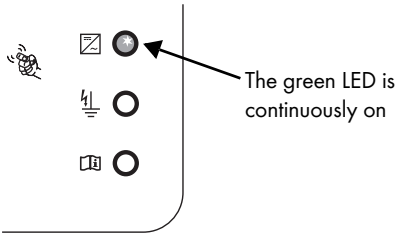
6.2 Blink Codes

Overview

Green	Red	Yellow	Status
glows continuously	does not glow	does not glow	OK (feeding operation)
	glows continuously	does not glow	disturbance
		glows continuously	OK (initialization)
flashes quickly (3 x per second)	does not glow	does not glow	OK (stop)
	glows continuously	does not glow	disturbance
flashes slowly (1 x per second)	does not glow	does not glow	OK (waiting, grid monitoring)
	glows continuously	does not glow	disturbance
briefly goes out (approx. 1x per second)	does not glow	does not glow	OK (derating)
	glows continuously	does not glow	disturbance
does not glow	does not glow	does not glow	OK (night shutdown)
		glows/flashes	disturbance
	glows continuously	does not glow	disturbance
		glows/flashes	disturbance

Feeding Operation

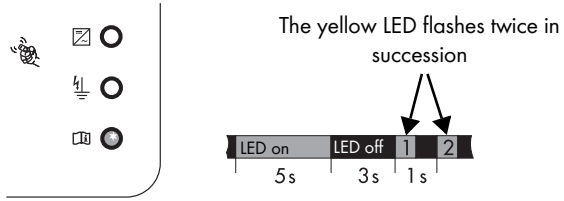
After a fault-free grid connection of the Sunny Boy, it takes approximately one minute until the green LED is continuously on. The blink codes shown before only have the purpose of indicating the initialization of the Sunny Boy and the process of controlling whether the power supply requirements are fulfilled.



Disturbance or Fault

If the Sunny Boy detects a disturbance or fault, this is indicated through a blink code of the yellow and, where applicable, the red LEDs.

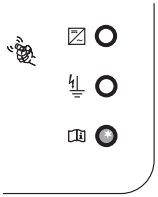
For example, if the yellow LED glows for 5 seconds immediately after connection, then goes out for 3 seconds and then flashes briefly twice, there is a grid fault. This could be because either the AC cable has not yet been connected correctly or the line circuit breaker has not yet been switched on.

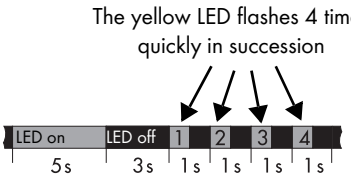


Explanation of the Blink Codes

For a detailed description of the blink codes, see the provided user manual of the Sunny Boy.

PV Overvoltage





NOTICE!

Excessive DC voltage can destroy the Sunny Boy!

➢ Immediately disconnect the Sunny Boy!

- Switch the line circuit breaker off.
- Remove the Electronic Solar Switch.
- Disconnect the DC plug connectors.

Check DC voltage!

- Higher than maximum input voltage: contact the planner / installer of the PV generator for assistance.
- Lower than maximum input voltage: reconnect the Sunny Boy to the generator as described in section 5.2 „Connecting the PV Generator (DC)“ (16).

  If the message occurs again, disconnect the Sunny Boy again and contact the SMA Service Line (see section 13 „Contact“ (44)).

7 Opening and Closing

NOTICE!

Electrostatic discharges can damage the Sunny Boy!

Internal components of the Sunny Boy can be irreparably damaged by electrostatic discharge.

- Ground yourself before you touch a component.

7.1 Opening the Sunny Boy

DANGER!

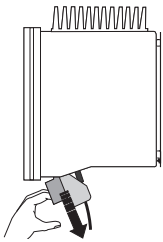
Danger to life due to high voltages in the Sunny Boy!

Before you open the Sunny Boy:

- Switch off the line circuit breaker and secure it to prevent it from being reactivated.

1. Remove the Electronic Solar Switch.

   Be sure to pull the handle downwards and slightly towards the wall. There is a contact in the middle that automatically starts the switching process when the handle is pulled.



DANGER!

Danger to life due to unsafe disconnection from the PV generator!

Safe disconnection from the PV generator is only guaranteed after removal of the Electronic Solar Switch **and** of all DC plug connectors.

- Remove the DC plug connector immediately to completely disconnect the PV generator from the Sunny Boy.

2. Check whether all LEDs and the display have gone out.

DANGER!

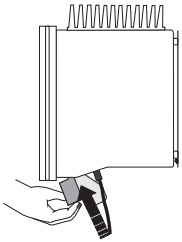
Danger to life due to high voltages in the Sunny Boy!

- Wait 15 minutes for the capacitors to discharge.

3. Safe disconnection from the PV generator is only guaranteed after removal of the Electronic Solar Switch and of all DC plug connectors.
4. Remove the PE connection from the cover by loosening the locking device of the PE connection on the cover.

7.2 Closing the Sunny Boy

1. Reconnect the protective earth (PE) to the housing cover.
2. Secure the housing cover of the Sunny Boy by evenly tightening the 4 screws.
3. Connect the PV generator by reconnecting the DC plug connectors of the Sunny Boy with those of the strings.
4. Check the Electronic Solar Switch for wear, as described in section 8.2 „Checking the Electronic Solar Switch for Wear" (33).
5. Reinsert the Electronic Solar Switch in the socket on the underside of the Sunny Boy.



NOTICE!

Manipulating the connector in the handle can damage the Electronic Solar Switch!

The connector within the handle must remain movable in order to ensure proper contact. Tightening the screw voids all warranty claims and creates a fire risk.

- Do **not** tighten the connector screw in the Electronic Solar Switch handle.

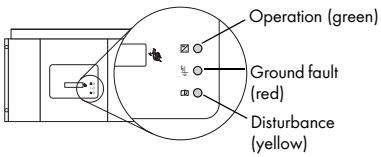
NOTICE!

The Electronic Solar Switch can be damaged if it is inserted incorrectly!

The Electronic Solar Switch can be damaged by high voltage if it has not been attached properly.

- Press the handle firmly into place on the socket of the Electronic Solar Switch until it audibly locks into place.
- Check that the handle is securely in place.

6. Switch on the line circuit breaker.
7. Check whether the LED display of the Sunny Boy indicates that the device is functioning correctly.



8 Maintenance and Cleaning

Check the correct operation of the Sunny Boy at regular intervals. Impurities such as dust or airborne blossoms can cause heat concentration that can lead to yield losses. Also check the Sunny Boy and the cables for visible external damage. Undertake repairs if necessary.

8.1 Cleaning the Cooling Fins

CAUTION!

Danger of burn injuries due to hot housing parts!

- Do not touch the housing of the Sunny Boy during operation.

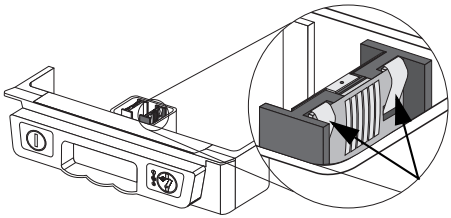
The heat dissipation of the product can be restricted by unclean cooling fins.

- Clean the cooling fins with a suitable, soft brush.

8.2 Checking the Electronic Solar Switch for Wear

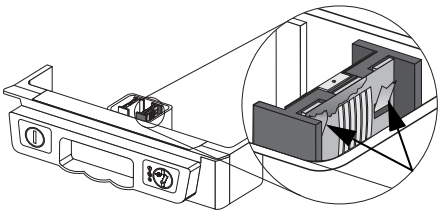
To check the Electronic Solar Switch for wear, proceed as follows:

1. Remove the Electronic Solar Switch.
2. Check whether metal tongues inside the connector have a brown discoloration or are burned off.



☑ If all metal tongues are in acceptable condition (as illustrated above), the Electronic Solar Switch can continue to be used.

☑ If at least one of the metal tongues has a brown discoloration or is completely burned off (as illustrated below), proper functioning of the Electronic Solar Switch is no longer guaranteed.



3. Replace the defective Electronic Solar Switch before reactivating the Sunny Boy. You can purchase replacements from SMA Solar Technology (see section 12 „Accessories“ (43)).

9 Troubleshooting

If the Sunny Boy displays other blink codes or display messages than described in section 6 „Commissioning“ (26), read the associated user manual in order to obtain the precise meaning of the display messages or the blink codes and, if necessary, the error correction.

Do not undertake any repairs that are not described here, but rather use the 24-hour replacement service (the Sunny Boy will be sent within 24 hours) and the repair service of SMA Solar Technology.

9.1 The Red LED is Continuously on

If the red LED of the status display is continuously on during operation, there is either a ground fault in the PV generator or at least one of the varistors for the overvoltage protection is defective.

9.1.1 Checking the PV Generator for Ground Fault

1. Disconnect the Sunny Boy from both the DC and AC connections, as described in section 7.1 „Opening the Sunny Boy“ (31).
2. Measure the voltages between the plus and minus pole of a string against the ground potential.

   If voltage is found, there is a ground fault in the corresponding string.

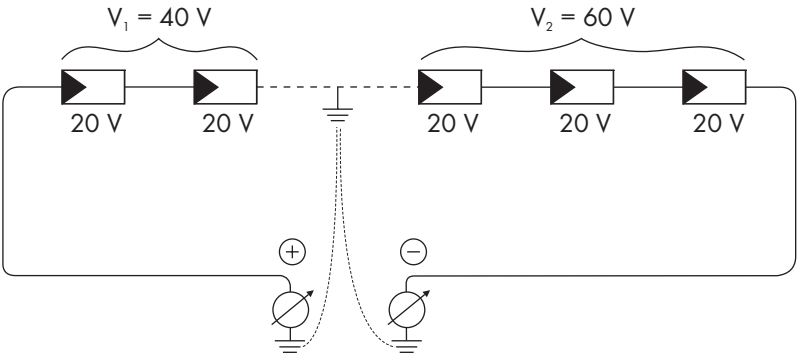
DANGER!
Risk of lethal electric shock!

In case of a ground fault, the PV generator may carry high voltages.

- Do not touch the frame of the PV generator.
- Do not touch PE.
- Wait until no voltage can be measured.
- Do not connect strings with ground faults to the Sunny Boy.

The approximate position of the ground fault can be determined from the ratio of the measured voltages between plus against ground potential and minus against ground potential.

Example:



The ground fault is between the second and third module in this case.

3. Repeat step 2 for each string.

The table illustrated below shows the various results and corresponding measures.

Result	Measure
You have found **a ground fault**.	• The installer of the PV generator must remedy the ground fault in the affected string before you may reconnect the string to the Sunny Boy. • **Do not** reconnect the faulty string. • Close the Sunny Boy and operate as described in section 7.2 „Closing the Sunny Boy" (32).
You have found **no ground fault**.	It is likely that one of the thermally monitored varistors is defective. • Check the varistors as described in section 9.1.2 „Checking the Function of the Varistors" (36).

☑ The ground fault check is finished.

9.1.2 Checking the Function of the Varistors

Varistors are wearing parts. Their functioning becomes restricted through aging or due to repeated responses as a result of overvoltages. It is therefore possible that one of the thermallly monitored varistors has lost its protective functioning, and thus the red LED is lit.

Position of Varistors

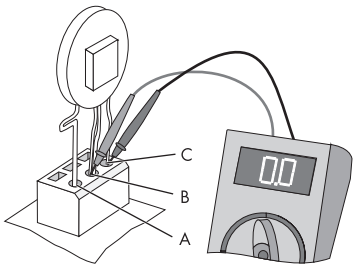
The position of the varistors can be seen in section 5.1.2 „View from Inside“ (15).

Observe the following allocation of the terminals:

- Terminal A: outer terminal (varistor connection **with crimp**)
- Terminal B: middle terminal
- Terminal C: outer terminal (varistor connection **without crimp**)

You can check the functioning of the varistors in the following manner:

1. Open the Sunny Boy as described in section 7.1 „Opening the Sunny Boy“ (31).
2. With the aid of a multimeter, determine for both varistors in the installed state whether a conductive connection exists between connectors B and C.

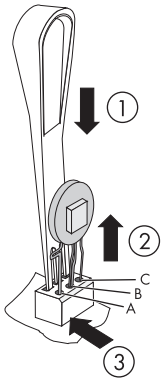


Result	Measure
There is a **conducting connection**.	There is probably another fault in the Sunny Boy. • Close the Sunny Boy as described in section 7.2 „Closing the Sunny Boy“ (32). • Contact the SMA Service Line (see section 13 „Contact“ (44)).
There is **no conducting connection**.	The respective varistor is not working and must be replaced. The varistors are specially manufactured for use in the Sunny Boy and are not commercially available. They must be ordered directly from SMA Solar Technology (see section 12 „Accessories“ (43)). • For the replacement of the varistors, continue with step 3.

3. Replace both varistors, as illustrated in the adjacent drawing, with new ones.
   - Insert an extractor tool into the openings of the terminal contacts (1).
   - ☑ The terminals will loosen.
   - Remove the varistor (2).
   - The pole with the small loop (crimp) must be fitted to terminal A (3) when remounting.

   Varistor failure is generally due to influences which affect all varistors similarly (temperature, age, induced overvoltage). It is therefore strongly recommended that you replace both varistors.

   If you did not receive an extractor tool together with the replacement varistors for the servicing of the terminals, contact SMA Solar Technology. The terminal contacts can also be provisionally serviced by a screwdriver with a 3.5 mm blade width. In the process, pay attention to the correct orientation of the varistors!



NOTICE!

The Sunny Boy could be irreparably damaged by overvoltage!

If varistors are missing, the Sunny Boy is no longer protected against overvoltages.

- Replacement varistors should be obtained as soon as possible.
- **Do not** operate the Sunny Boy without varistors in systems with a high risk of overvoltages.

4. Close the Sunny Boy as described in section 7.2 „Closing the Sunny Boy“ (32).

☑ The check of the varistors is now complete.

10 Decommissioning

10.1 Disassembling the Sunny Boy

CAUTION!

Risk of injury due to the heavy weight of the Sunny Boy!

- Take the Sunny Boy's weight of approximately 25 kg into account.

1. Open the Sunny Boy as described in section 7.1 „Opening the Sunny Boy“ (31).
2. Remove all cables from the Sunny Boy.
3. Close the Sunny Boy: fasten the housing cover to the Sunny Boy with the 4 screws.
4. Disassemble the Sunny Boy.

10.2 Packaging the Sunny Boy

If possible, always package the Sunny Boy in the original packaging. If this is no longer available, you can also use an equivalent box that fulfills the following requirements:

- suitable for loads up to 25 kg
- with handle system
- can be closed fully

10.3 Storing the Sunny Boy

Store the Sunny Boy in a dry place where ambient temperatures are always between -25 °C and +60 °C.

10.4 Disposing of the Sunny Boy

Dispose of the Sunny Boy at the end of its service life in accordance with the disposal regulations for electronic waste which apply at the installation site at that time. Alternatively, send it back to SMA Solar Technology with shipping paid by sender, and labeled "ZUR ENTSORGUNG" ("for disposal").

11 Technical Data

PV generator connection data		SB 1100	SB1700
Max. input voltage	$U_{DC\ max}$	400 V [a]	
Input voltage, MPP range	U_{PV}	139 V ... 320 V	
Max. input current	$I_{PV,\ max}$	10 A	12.6 A
Max. input power	P_{DC}	1210 W	1850 W
Recommended total generator power		1350 Wp (for Central Europe)	2050 Wp (for Central Europe)
Voltage ripple	U_{PP}	< 10 % of the input voltage	
Internal consumption during operation		< 4 W (standby)	< 5 W (standby)

a) The maximum open circuit voltage, that can occur with - 10 °C cell temperature may not exceed the maximum input voltage.

Grid connection data		SB 1100	SB 1700
Nominal output power	$P_{AC,\ nom}$	1000 W	1550 W
Peak output power	$P_{AC,\ max}$	1100 W	1700 W
Nominal output current	$I_{AC,\ nom}$	4.4 A	6.7 A
Max. output current	$I_{AC,\ max}$	5.6 A	8.6 A
Max. fuse protection		16 A	
Harmonic distortion of output current (at K_{Ugrid} < 2 %, P_{AC} > 0.5 P_{ACnom})	K_{IAC}	< 3 %	
Short-circuit tolerance		grid-side via current regulation	
Nominal operating voltage	$U_{AC,\ nom}$	220 V / 230 V / 240 V	
Voltage range (extended operating range)	U_{AC}	180 V ... 260 V	
Nominal operating frequency	$f_{AC,\ nom}$	50 Hz / 60 Hz	
Frequency range (extended operating range)	f_{AC}	50 Hz: 45.5 Hz ... 54.5 Hz 60 Hz: 55.5 Hz ... 64.5 Hz	
Power factor (at nominal output power)	cos phi	1	
Overvoltage category		III	
Test voltage (DC)		1.7 kV (1 s routine testing / 5 s type testing)	
Surge testing voltage		4 kV (serial interface: 6 kV)	
Internal consumption in night operation		0.1 W	

General data	SB 1100	SB 1700
EC Declaration of Conformity	You can download the EC Declaration of Conformity in the download area at www.SMA.de under Certificate.	
Dimensions (W x H x D)	approx. 434 mm x 295 mm x 214 mm	
Weight	approx. 22 kg	approx. 25 kg
Protection rating according to DIN EN 60529	IP65	
Climatic conditions according to DIN EN 50178:1998-04		
Location of type C:	class 4K4H extended temperature range: -25 °C ... +60 °C extended humidity range: 0 ... 100 %, extended air pressure range: 79.5 kPa ... 106 kPa	
Transport of type E:	class 2K3 Temperature range: -25 °C ... +70 °C	
Operation temperature range	-25 °C ...+60 °C	
Max. operating altitude	2000 m above sea level.	
Topology	transformer	
Protection class	I	

Protective function DC side	
All-pole disconnection unit on the DC input side	Electronic Solar Switch, DC plug connector
Overvoltage protection	thermally monitored varistors
Personal protection	insulation monitoring (Riso > 1MOhm)
Pole confusion protection	via short-circuit diode

Protective function AC side	
Short-circuit tolerance	current control
All-pole disconnection unit grid side	automatic disconnection device (grid guard 2.1), double implementation

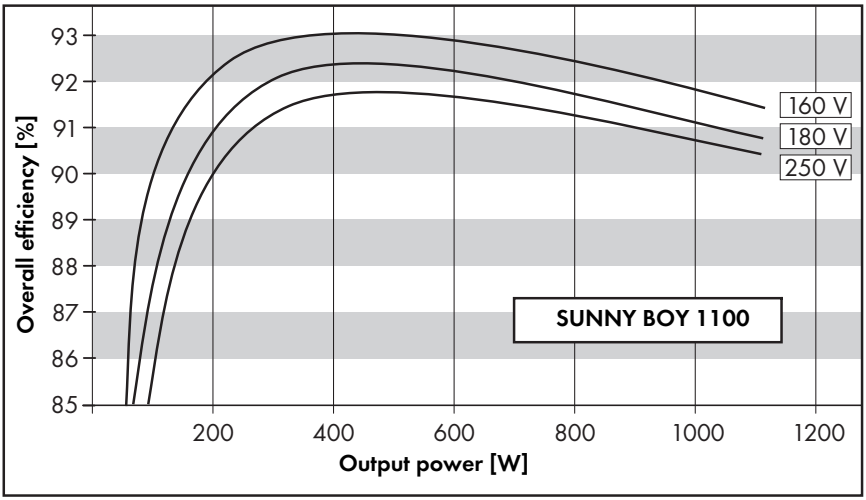
Communication interfaces	SB 1100	SB 1700
RS485 (galvanically isolated)	optional	
Radio	optional	

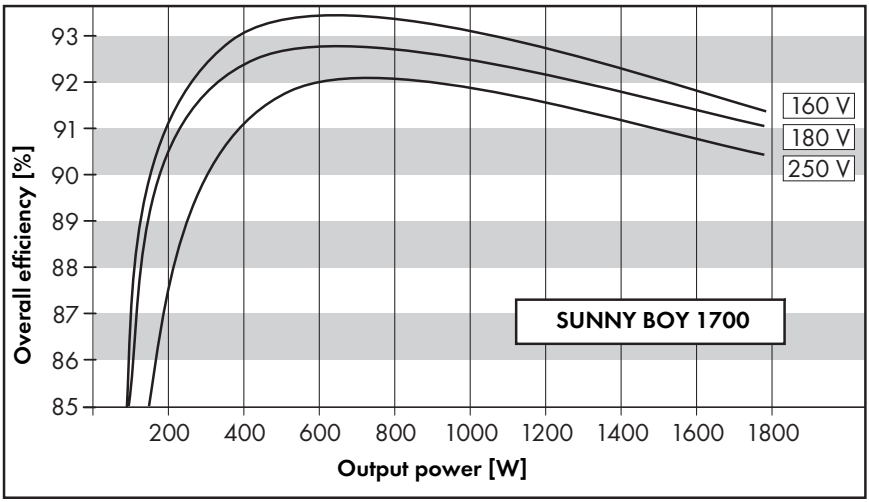
Electronic Solar Switch (ESS)	
Electrical service life (in case of a short circuit, with a nominal current of 30 A)	min. 50 switching processes
Maximum switching current	30 A
Maximum switching voltage	800 V

Electronic Solar Switch (ESS)	
Maximum PV power	approx. 10 kW
Protection rating when plugged	IP65
Protection rating when unplugged	IP21

Efficiency		SB 1100	SB 1700
Max. efficiency	η_{max}	93 %	93.5 %
CEC rebate efficiency	η_{euro}	91.6 %	91.8 %

Efficiency graphs




93
92
91
90
89
88
87
86
85
Overall efficiency [%]
200
400
600
800
1000
1200
1400
1600
1800
Output power [W]
160 V
180 V
250 V
SUNNY BOY 1700

12 Accessories

You will find the corresponding accessories and replacement parts for your product In the following overview. If needed, you can order these from SMA Solar Technology or your dealer.

Name	Brief description	SB 1100 / SB 1700 SMA order number
Replacement varistors	Set of thermally monitored varistors (2 pcs.) including insertion tool SB-TVWZ	SB-TV3
Positive grounding set	Refit set for the positive connection to ground of the DC input	ESHV-P-NR
Negative grounding set	Refit set for the negative connection to ground of the DC input	ESHV-N-NR
Electronic Solar Switch	ESS handle replacement part	ESS-HANDLE:01
RS485 upgrade kit	RS485 interface	485PB-NR
Radio upgrade kit	Radio Piggy-Back for upgrading a Sunny Boy for communication with Sunny Beam, including antenna, coaxial cable, and PG cable gland (metal)	BEAMPB-NR
Bluetooth upgrade kit	Bluetooth interface	on request
DC connection set Multi-Contact 3 mm	Multi-Contact 3 adapter set, max. flow current: 21 A	SWR-MC
DC connection set Multi-Contact 4 mm	Multi-contact 4 adapter set, max. flow current: 30 A	MC-SET
Tyco DC connection set	TYCO adapter set, max. flow current: 30 A	TYCO-SET

13 Contact

If you have technical problems concerning our products, please contact the SMA Service Line. We require the following information in order to provide you with the necessary assistance:

- Inverter type
- Type and number of modules connected
- Communication method
- Series number of the Sunny Boy
- Blink code or display of the Sunny Boy

SMA Solar Technology AG

Sonnenallee 1

34266 Niestetal, Germany

www.SMA.de

Service Line

Inverters:	+49 561 9522 1499
Communication:	+49 561 9522 2499
SMS return call:	+49 176 888 222 44
Fax:	+49 561 9522 4699
E-mail:	Serviceline@SMA.de

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- Improper or inappropriate use of the product
- Operating the product in an unintended environment
- Operating the product whilst ignoring relevant, statutory safety regulations in the deployment location
- Ignoring safety warnings and instructions contained in all documents relevant to the product
- Operating the product under incorrect safety or protection conditions
- Altering the product or supplied software without authority
- The product malfunctions due to operating attached or neighboring devices beyond statutory limit values
- In case of unforeseen calamity or force majeure

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SMA Solar Technology AG

Sonnenallee 1

34266 Niestetal

Germany

Tel. +49 561 9522-0

Fax +49 561 9522-100

www.SMA.de

E-Mail: info@SMA.de

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SMA Solar Technology AG

www.SMA.de

Sonnenallee 1
34266 Niestetal, Germany
Tel.: +49 561 9522 4000
Fax: +49 561 9522 4040
E-Mail: Vertrieb@SMA.de
Freecall: 0800 SUNNYBOY
Freecall: 0800 78669269